10. CROSSCUTTING CONSIDERATIONS

10.1. Introduction. Several topics of particular importance are addressed in multiple phases or stages of the system life cycle. These include:

- o Project Management Plan
- o Project Participation
- o Project Reviews and Quality Assurance
- o Project Approvals
- o Configuration Management
- o Data Administration
- o Methodologies and Tools
- o Benefit-Cost Analysis

Specific activities relating to each of these topics is presented in the previous chapters of Part 2 of this Guidance. This chapter briefly describes each topic from a crosscutting, life cycle wide perspective. Additional detail on several of these topics is provided in the Practice Papers comprising Part 3 of this Guidance.

10.2. Project Management Plan. The Project Management Plan is the fundamental document for planning and managing the system life cycle, and is mandatory for every project. It is first developed in the Initiation phase, and is updated, expanded, and refined continually throughout the life cycle. Exhibit 10-1 presents the major topics included in the Project Management Plan, illustrating how each section of the plan evolves throughout the life cycle. The topics presented in Exhibit 10-1 refer to the approach and logistics for conducting the project. Specific characteristics of the system and data base(s) (e.g., security, data conversion) are documented in other products. Although the Project Management Plan exists as a single document, a wide variety of methods and tools may be used to develop and maintain the plan, including automated project management tools. More detailed outlines showing the evolution of the Project Management Plan through individual phases and stages are presented in Chapters 1 through 9 of Part 2 of the Guidance.

Several important characteristics of the Project Management Plan are noted below.

- o **The Project Management Plan documents all of the life cycle management decisions made by the Project Manager.** This System Life Cycle Management Guidance provides a flexible approach which may be tailored to the unique characteristics of each information management problem and project. The Project Management Plan is the key to making that flexibility work by clearly documenting any adjustments to the life cycle. An explicit consideration of the life cycle approach to each project, and clear documentation of any adjustments, assures that all

important issues have been addressed, the adjustments made can be communicated effectively to the appropriate participants in the project, and the reasoning behind each adjustment is recorded to guide future decisions and to answer questions that may arise later in the life cycle.

- **The Project Management Plan evolves throughout the life cycle.** As issues arise and decisions are made, the Project Management Plan is updated to reflect them. At any moment in the life cycle, the Project Management Plan provides a clear picture of project management decisions made to date and future project management direction.

- **The Project Management Plan supports the coordination of the various organizations and individuals involved in the project.** The Project Management Plan is an invaluable tool for effective coordination among project participants. Particularly in large projects, participants may work in greater or lesser degrees of isolation. The Project Management Plan provides an up-to-date picture of each participant's role and how it relates to other project activities.

- **The Project Management Plan is subject to review and approval by OSWER program management.** Because of its importance to the direction of the project, the Project Management Plan is subject to program management review and approval. This helps ensure that project direction decisions clearly support the overall objective of solving an information management problem. Key elements of the Project Management Plan are included in the Decision Papers prepared for formal program management approval.

Part 3 of this Guidance includes a Practice Paper that discusses the Project Management Plan in more detail.

10.3. Project Participation. Information management problems and projects to resolve them require the participation of organizations and individuals with a diverse set of experience and skills. These range from an in-depth understanding of pertinent EPA programs to expertise in specific information management technologies. Successful projects require that certain important roles be specifically assigned to organizations and individuals. These roles, and the organizations from which individuals typically are drawn to fulfill these roles, are summarized below.

- **OSWER Program Management** serves as the sponsor and ultimate decision authority regarding all aspects of the project, ranging from the initial delineation of the nature and scope of the problem to the decision to place

the system into full production. This role is accomplished by a line program manager or, for a system with broad programmatic impact, potentially by a group of managers (such as the OSWER Information Management Steering Committee). For a given project, the program management role may be filled by an individual from an office at Headquarters or a regional office.

- **OSWER Program Staff** consists of the individuals who directly experience the information management problem, and who will likely be the users of the system. This role provides the user view of the problem and insights regarding potential solutions. Of particular note, this role is embodied in individuals other than those assigned specifically to the project team. These individuals are consulted by the project team to define functional and data requirements and discuss specific features of the solution. These individuals may be members of EPA headquarters offices, regional offices, state agencies, and/or other external organizations, and may be representative of any level of their respective organizations.

- **Project Management** directs the project and is accountable for its success. For national systems, this role is performed by a member of OSWER, although projects may be managed by a member of another EPA office at Headquarters or a regional office. This role is often accomplished by a single individual, but for a large project with broad programmatic impact may require a team of individuals acting in a project management support role.

- **Project Staff** are the other participants in the project team tasked with solving the problem. These individuals accomplish the majority of life cycle activities, bringing to bear specific areas of expertise including knowledge of pertinent EPA programs and organizations, existing information systems, and various systems analysis and development methods, tools, and technologies. For most projects, this role is performed by multiple individuals and may include individuals drawn from EPA headquarters offices, regional offices, state agencies, contractors, grantees, and/or other external organizations. These individuals may be representative of any level of their respective organizations.

- **Quality Assurance** is the role responsible for reviewing the products of the life cycle effort to confirm that the project team is proceeding in an appropriate direction and will effectively solve the stated problem. This role is generally performed by individuals with substantial experience and knowledge of pertinent

programs, analytic tools and methods, and information management technologies. These individuals may be drawn from EPA headquarters offices, regional offices, state agencies, contractors, grantees, and/or other external organizations, but should not be the same individuals as those participating as members of the project team.

- **Procurement** is a support role that provides expertise in the EPA and government-wide laws and regulations governing the acquisition of information management technology and services. This role is performed by a procurement and contracts specialist, usually a member of an organization outside of OSWER, such as the Office of Information Resources Management (OIRM), the National Data Processing Division (NDPD), and/or the Procurements and Contracts Management Division (PCMD) within the Office of Administration.

Part 3 of this Guidance includes a Practice Paper that discusses Project Participation in more detail.

10.4. Project Reviews and Quality Assurance. Independent review of the products of the system life cycle is performed to ensure that the project team is proceeding in an appropriate direction to effectively solve the information management problem. The reviews address programmatic issues, technical considerations, and project management, and provide feedback to the project team as well as advice to the individuals required to approve the project. Project reviews and other quality assurance activities are performed throughout the life cycle, as illustrated in Exhibit 10-2. This exhibit also illustrates the related approvals throughout the life cycle.

Several important aspects of project reviews and quality assurance are noted below.

- **The reviews to be conducted and other planned quality assurance activities are documented in the Project Management Plan.** These efforts are included as an integral part of the Project Management Plan, and are reflected in various sections of the Project Management Plan -- Project Team Organization, Workplan, and a section devoted exclusively to project reviews and quality assurance.

- **Quality Assurance is a continual part of the project effort.** The overall approach for project reviews and quality assurance is initially formulated during the Initiation phase, and is completed by the end of the Concept phase. This approach addresses the entire life cycle, and is updated as appropriate to reflect the experience of the project effort. Quality assurance is not simply the acceptance testing of a system prior to full implementation. The early and continuing emphasis

on quality helps ensure that quality is built into the information management solution as an intrinsic part of project, and not through numerous, and often expensive, corrections in the latter stages of the life cycle.

- **Quality Assurance applies to all aspects of the project.** Project reviews and other quality assurance activities focus on programmatic, technical, and project management issues, and the relationship among them. All products are examined -- including the Project Management Plan and Decision Papers -- to ensure that they adequately fulfill their intended purpose. These examinations help ensure that technical and project management decisions fully consider their program management impact, and are realistic in view of the requirements and constraints of the project.

- **Formal reviews are structured to ensure a level of review commensurate with the nature and scope of the information management problem and potential solution.** Each project will include an analysis of the proper level of review, and will include the results of this analysis in the Project Management Plan. This analysis, called threshold analysis, considers such factors as the organizations who will be supplying data to or using the system, system costs, and the organizations whose procedures and/or resource may be directly affected by the system.

- **The results of reviews are included in each Decision Paper.** Reviews are directed to two audiences. One is the project team, which receives direct feedback from the review. The second is OSWER program management, which uses the results of the review as one of the inputs to providing the required approvals. This second audience is served by including a summary of the review results and recommendations in the Decision Paper for the phase or stage corresponding to the review.

Part 3 of this Guidance includes a Practice Paper that discusses project reviews, and related project approvals, in more detail.

10.5. Project Approvals. Formal approvals are provided throughout the system life cycle to ensure that OSWER program management supports the project, and is in agreement with the chosen project direction. These approvals are provided at a level commensurate with the nature and scope of the system. Specific approval activities are identified in Exhibit 10-2.

Several important aspects of project approvals are noted below.

- **A summary of the information that program managers need for approval is presented in the Decision Papers.** The life cycle products which support the approval process (the Decision Papers) are very brief; they contain, in summary form, the management information which program management needs to determine whether the life cycle effort is progressing satisfactorily. Any additional information that program management may request is usually available in one of the normal life cycle products or through the review process.

- **Approvals are obtained at a level of program management commensurate with the nature and scope of the information management problem and potential solution.** Each project conducts an analysis of the proper level of approval, and includes the results of this analysis in the Project Management Plan. This analysis is conducted jointly with the determination of the proper level of review, and its results are documented in the Project Management Plan.

- **Project reviews precede management approvals.** Project approvals reflect a consideration of the products of the life cycle, and the results of a review of these products. Program managers utilize the results of project reviews to confirm that the project direction is sound, particularly with regard to those technical and systems project management issues where a manager may have limited expertise.

- **Preparing for and obtaining approvals is not the goal of the life cycle process, but only a means to assuring the real goal, successfully solving an information problem.** Project reviews and approvals utilize the products that <u>normally</u> result from the life cycle process, with the addition of Decision Papers. Decision Papers are <u>brief</u> documents, prepared to aid the approval process by providing program managers a synopsis of the information needed to make an informed decision.

Part 3 of this Guidance includes a Practice Paper that discusses project approvals, and the related project reviews, in more detail.

10.6. <u>Configuration Management</u>. Configuration management activities are conducted throughout the life cycle to ensure that the elements of the system and the status of each are readily identifiable at any point in time, and to ensure the overall integrity of the system. Exhibit 10-3 illustrates the key configuration management activities that are performed during each phase or stage of the life cycle.

Several important aspects of configuration management are noted below.

- **Effective configuration management depends on diligent maintenance of system baselines.** Many of the life cycle products will be refined over the course of the life cycle as the project team gains better insight into the information management problem and the many specific details of the solution. Each product is stored in a designated baseline, and careful records are kept of the modifications to each product. These modifications may be recorded as addenda to the product, or complete replacements. Exhibit 10-3 identifies the baselines generated and updated at each phase and stage of the life cycle. Exhibit 10-4 identifies the contents of each baseline. Of particular note, the products contained in the baselines are those generated by project execution activities -- those products which will eventually become part of the operational system. Other products, such as the Project Management Plan, are not controlled in baselines.

- **Configuration management is a continual part of the project effort.** A configuration management function is established during the Concept phase, and is active throughout the life cycle. This function conducts several key activities:

  -- Ensures that all key products are recorded and stored for effective future use and reference. Each such documented is stored in a designated baseline.

  -- Records and monitors the status of requested modifications to the system.

  -- Administers a change control process to consider and determine the disposition of requested modifications to the system.

  -- In support of project reviews, conducts audits of life cycle products to ensure that they are consistent with the content of prior products contained in the system baselines.

- **A Change Control Panel considers requested modifications to the system before they are made.** The panel is established by the project manager to review requests to modify any part of the system that has been baselined. This panel consists of individuals providing programmatic knowledge as well as technical expertise, and serves in an advisory capacity to the project manager.

- **The Configuration Management Plan is part of the Project Management Plan.** The Configuration Management Plan addresses the procedures to be used for all

configuration management activities. These procedures are tailored to each system.

Part 3 of this Guidance includes a Practice Paper that discusses configuration management in more detail.

10.7. Data Administration. OSWER's life cycle management approach emphasizes management of data resources. Because of the large volumes of data handled by OSWER systems, and the increasing trend toward sharing data across systems and programs, life cycle management activities are conducted and decisions are made with a particular focus on data resources. Exhibit 10-5 identifies the key activities associated with data administration through the life cycle, and the products containing the results of these activities. OSWER has established a data administration policy, and a Practice Paper devoted to data administration is provided in Part 3 of this Guidance.

Several important aspects of data administration are noted below:

- **A Data Management Plan is mandatory for each system project.** Like the Project Management Plan, the Data Management Plan is a mandatory life cycle product. It is first produced in the Initiation phase, and is updated, expanded, and refined continually throughout the life cycle. Detailed outlines showing the evolution of the Data Management Plan through individual phases and stages are presented in Chapters 1 through 9 of Part 2 of the Guidance.

- **A Data Dictionary is mandatory for every system.** A data dictionary must be prepared for every system, to clearly communicate the attributes of the data processed by the system to system users, and other individuals with an interest in the data processed by the system.

- **Data administration concerns cut across multiple systems.** For each project, data administration focuses on the relationship of the project to other projects and systems that process common data. Data administration addresses data definitions, data standards, mechanisms to ensure consistency of data across systems, data quality control procedures, and related issues that frequently cut across project and system boundaries. As OSWER develops an OSWER-wide data model in the future, data administration will address how a project or potential new (or enhanced) system relates to the implementation of the data architecture defined by the model.

10.8. Methodologies and Tools. Systems projects are conducted using established analytic, development, and maintenance methodologies to the greatest extent possible. As automated

tools become more available, it is expected that OSWER projects will increasingly use these tools to take advantage of the quality and productivity increases afforded to their users. Each project is expected to select and use appropriate methodologies and tools. This Guidance does not mandate the use of any specific methods or automated tools; however, it does require that choices be made explicitly. Exhibit 10-6 illustrates when the selections of methodologies and tools are usually made for individual life cycle phases and stages.

Several important considerations in the use of methodologies and tools are noted below:

- **Methodologies and tools are considered from a full system life cycle perspective.** The selection of a particular methodology or tool reflects its potential use throughout the life cycle and its relationship to other methods and tools. Methods and tools selected early in the life cycle provide benefits to the earliest phases and stages, but also may constrain the choices available in later phases and stages.

- **Decisions about methodologies and tools are documented in the Project Management Plan.** Specific selections are clearly documented and communicated to all appropriate project participants.

- **The methodologies and tools for each phase or stage are selected no later than the end of the preceding phase or stage.** Although some methods and tools will be selected with certainty at the outset of a project, the best choices for others will not be clear until later in the life cycle. However, to ensure their effective use, and enable training of team members in their use (if needed), specific methodologies and tools are selected prior to the start of the phase or stage in which they are to be used.

- **No methodologies or tools may be adopted as alternatives to the application of life cycle management.** Individual methodologies and tools are used to accomplish the activities of the life cycle and support life cycle decisions. They do not substitute for life cycle management. Some methodologies and tools (e.g., system prototyping, expert system shells) prescribe the combination of certain phases and/or stages. These methodologies may be used, but the project teams that use them must ensure that any adjustments to the life cycle provide a clear focus on life cycle decisions, provide documentation ultimately comparable to that identified in this Guidance, and ensure a proper level and frequency of review and approval. All life cycle adjustments are clearly described in the Project Management Plan.

10.9. Benefit-Cost Analyses. The important decisions of the system life cycle, and the prescribed management approvals, often hinge on two key questions: "How much will it cost?" and "Are the benefits worth the cost?" For each systems project, benefit-cost analyses are conducted early in the life cycle, and are updated continually as appropriate. Exhibit 10-7 identifies the activities that provide a benefit-cost analysis, and the document(s) containing the results of the analysis.

Several important aspects of benefit-cost analysis are noted below.

- **Benefit-cost analyses evolve from rough estimates in the early phases to increasingly detailed and accurate projections as the life cycle progresses.** At each phase or stage, information is gathered and decisions are made that enable the project team to make increasingly accurate projections of the benefits and costs of the system over its life cycle.

- **Benefit-cost analyses consider benefits and costs throughout the entire life cycle.** Each analysis provides an explicit consideration of onetime benefits and costs as well as those that are realized over the life of the system. The analysis also clearly identifies the incidence of each benefit and cost, denoting those organizations that are likely to realize the benefit and those that are likely to incur the cost.

- **Results of benefit-cost analyses are documented throughout the life cycle.** These results form the basis of the most important decisions of the life cycle, particularly those regarding the scope and direction of the project. Written documentation of the results is critical, and includes any significant assumptions made in conducting the analysis. Exhibit 10-7 identifies the documents containing these results, and outlines of these documents are provided in Chapters 1-9 of Part 2 of the Guidance. A summary of the benefit-cost analysis is included in every Decision Paper.

EXHIBIT 10-1: EVOLUTION OF PROJECT MANAGEMENT PLAN THROUGH THE SYSTEM LIFE CYCLE

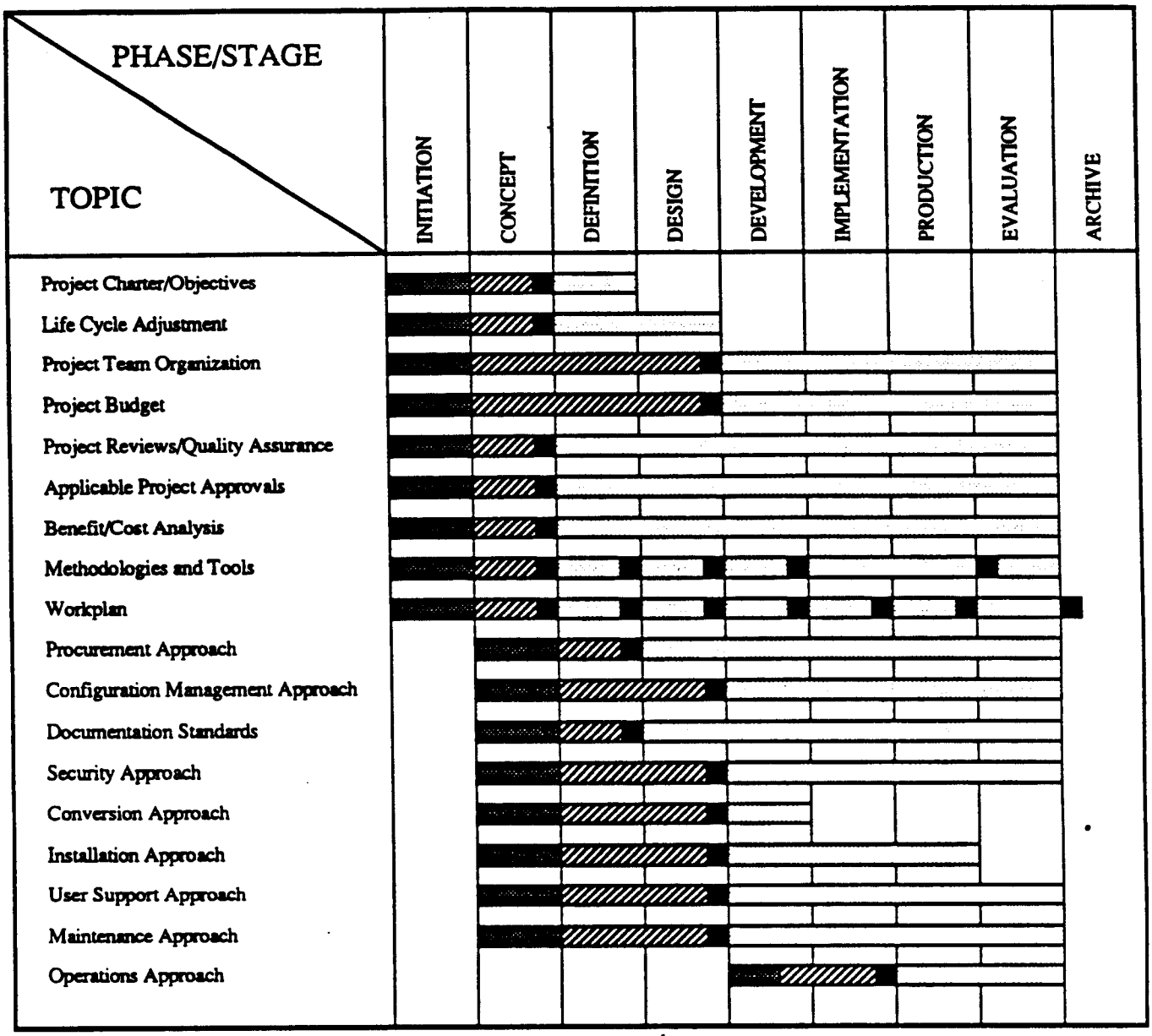

EXHIBIT 10-2: REVIEWS AND APPROVALS THROUGH THE SYSTEM LIFE CYCLE

PHASE/STAGE	REVIEW-RELATED ACTIVITIES	APPROVAL-RELATED ACTIVITIES
INITIATION	Prepare Initiation Decision Paper	Approve Initiation Decision Paper
CONCEPT	Review System Concept. Prepare Concept Decision Paper.	Approve Concept Decision Paper.
DEFINITION	Review functional requirements. Review data requirements. Prepare Definition Decision Paper.	Approve Definition Decision Paper.
DESIGN	Review System Design. Prepare Design Decision Paper.	Approve Design Decision Paper.
DEVELOPMENT	Conduct system tests. Prepare Development Decision Paper.	Approve Development Decision Paper.
IMPLEMENTATION	Conduct integration tests. Conduct acceptance tests. Review acceptance test results. Prepare Implementation Decision Paper.	Approve Implementation Decision Paper.
PRODUCTION	Review and respond to proposed changes. Test approved changes.	Approve system change requests as appropriate (per procedure documented in Configuration Management Plan).
EVALUATION	Conduct post-implementation evaluation. Conduct periodic mission, technical, and/or management evaluations.	Approve recommended changes as appropriate (per procedure documented in Configuration Management Plan).
[illegible]IVE	None.	None.

EXHIBIT 10-3: CONFIGURATION MANAGEMENT THROUGH THE SYSTEM LIFE CYCLE

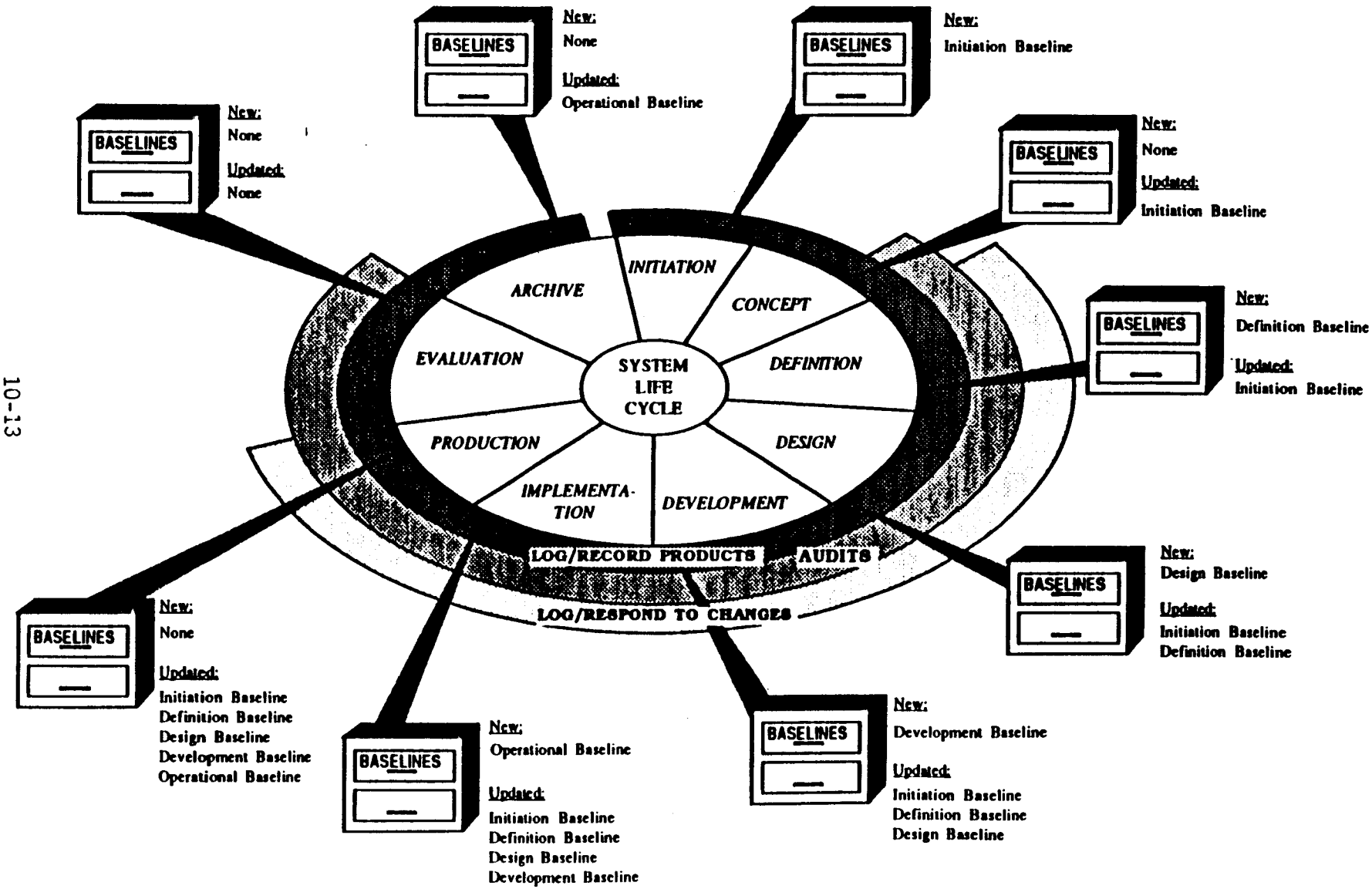

EXHIBIT 10-4: CONTENTS OF SYSTEM BASELINES

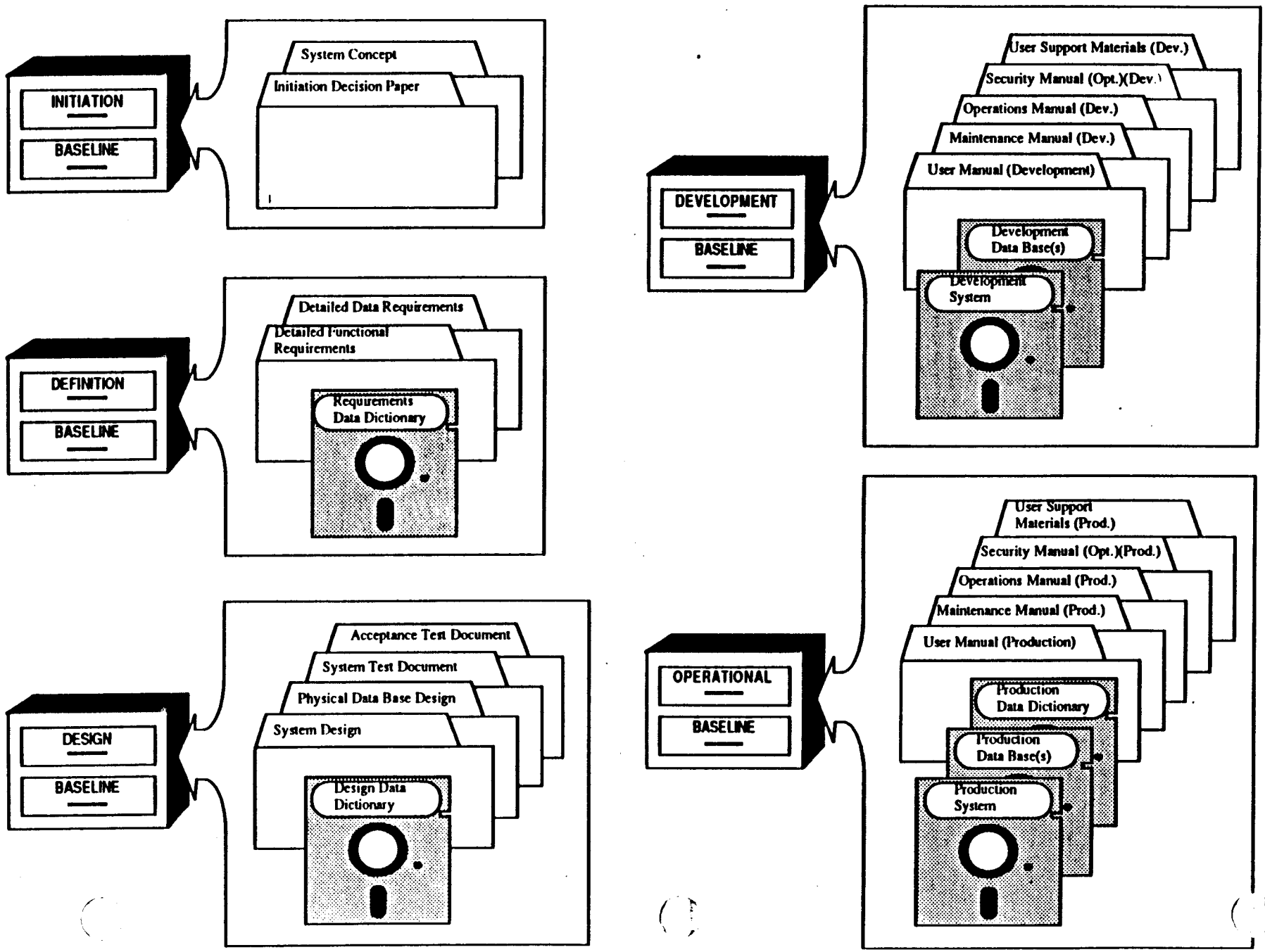

EXHIBIT 10-5: DATA ADMINISTRATION THROUGH THE SYSTEM LIFE CYCLE

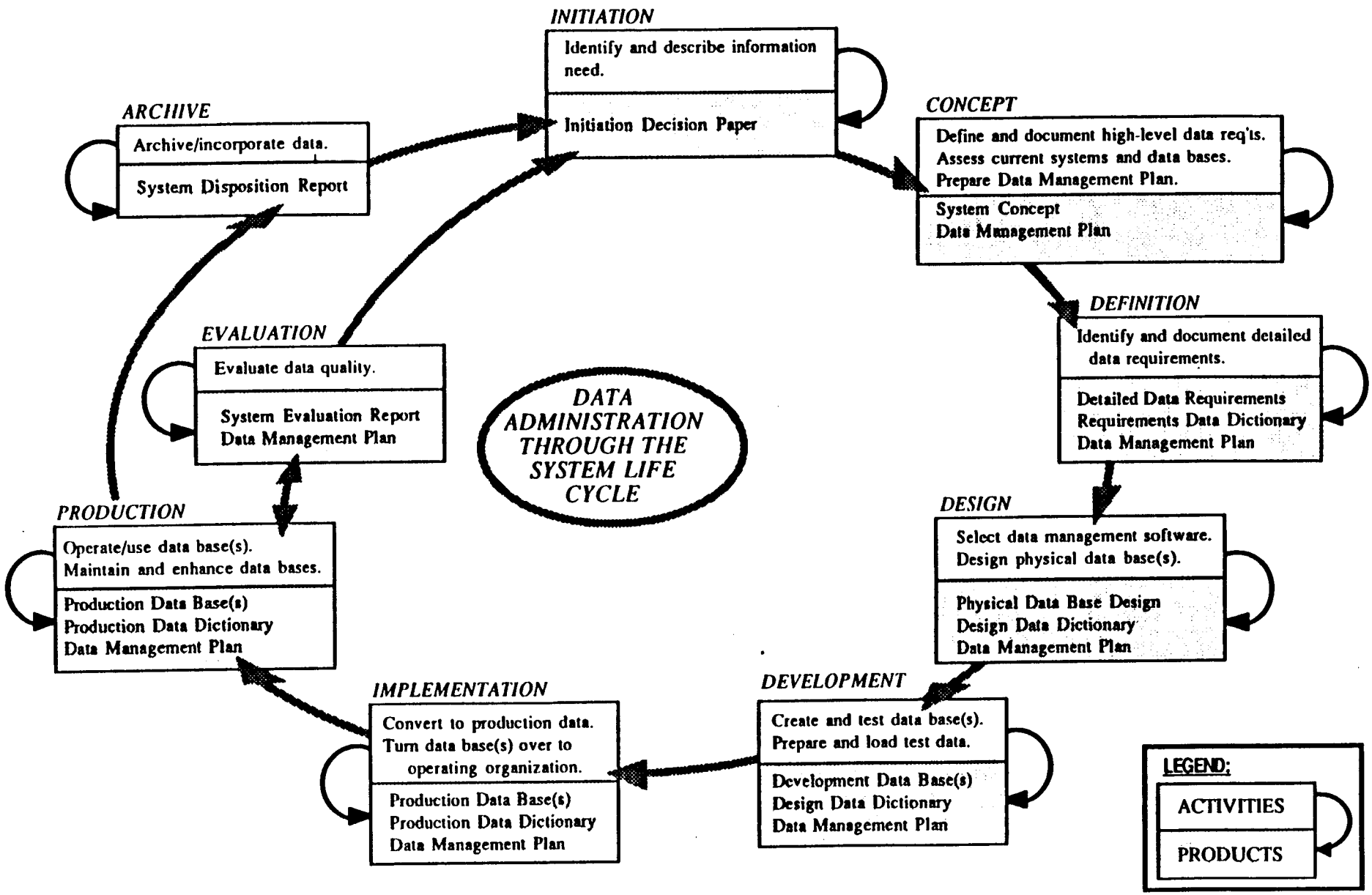

EXHIBIT 10-6: SELECTION OF TOOLS AND METHODOLOGIES THROUGH THE SYSTEM LIFE CYCLE

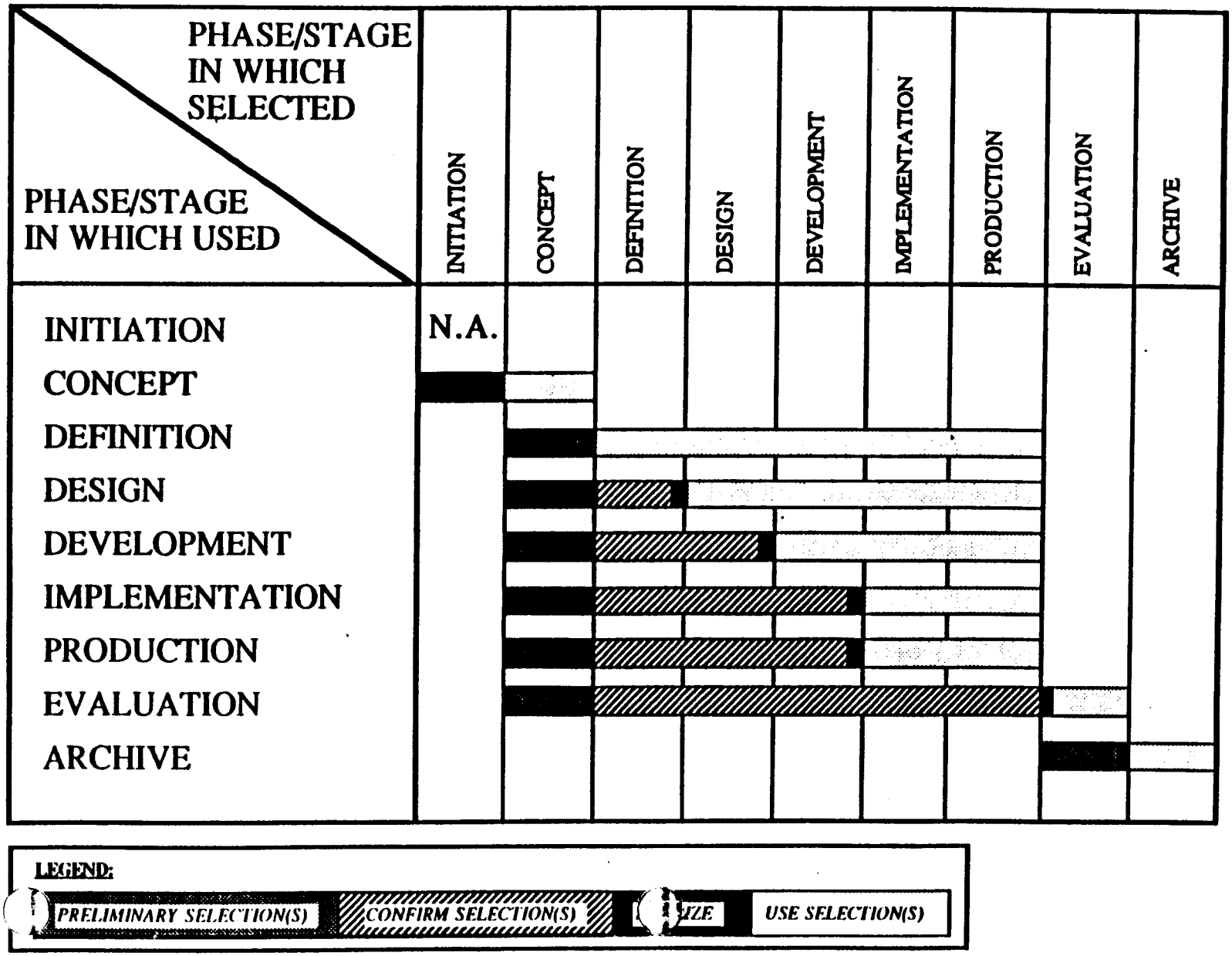

EXHIBIT 10-7: BENEFIT-COST ANALYSIS THROUGH THE SYSTEM LIFE CYCLE

PHASE/STAGE	ACTIVITIES	NEW/UPDATED DOCUMENTS
INITIATION	Describe information management problem (the solution of which represents the overall objective or benefit). Prepare a preliminary estimate of overall project (or system) scale -- represents the initial high-level cost estimate.	New: Initiation Decision Paper Project Management Plan
CONCEPT	Perform assessment of complete life cycle benefits and costs of alternative approaches, with as much detail as possible for recommended system concept.	New: System Concept (Contains complete analysis) Concept Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
DEFINITION	Refine and/or revise analysis to reflect better understanding. of benefits and costs of specific functional and data requirements.	New: Definition Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
DESIGN	Refine and/or revise analysis to reflect better understanding. of benefits and costs of specific system design features.	New: Design Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
DEVELOPMENT	Refine and/or revise analysis to reflect the impact of any changes to the system design made during Development, and the impact of any known changes to be made in the future.	New: Development Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
IMPLEMENTATION	Refine and/or revise analysis to reflect the impact of any changes to the system design made during Implementation, and the impact of any known changes to be made in the future.	New: Implementation Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
PRODUCTION	Conduct benefit-cost analyses of indivdual requested changes and enhancements to the system.	New: System Change Requests (or equivalent) Updated: Project Management Plan (Summary of analysis for approved changes and enhancements only)
EVALUATION	Update benefit-cost analysis to reflect experience to date, and recommended future changes.	New: System Evaluation Reports Updated: Project Management Plan (Summary of analysis for approved changes and enhancements only)
ARCHIVE	None.	None.